

CENG 111
Introduction to Computer Engineering Concepts
2025-2026 Fall

Instructors:

Hüseyin Aydın (Section 1 and 2), Sinan Kalkan (Section 3)

Teaching Assistants:

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Course Schedule:

Section 1	Section 2	Section 3
Tue: 13:40, 14:40 (BMB-4) Thu: 9:40 (BMB-4)	Tue: 9:40, 10:40 (BMB-2) Thu: 11:40 (BMB-2)	Tue: 9:40, 10:40 (BMB-1) Thu: 11:40 (BMB-1)

Lab Schedule: TBA. **Prerequisites:** None

Catalog Description:

Introduction to the fundamentals of computer systems, including computer organization, operating systems, language processors and user interfaces. Introduction to algorithms and programming. Reasoning informally about the correctness and efficiency of programs. A functional programming language will be used for practical work.

Course Objectives:

To provide a basic understanding of fundamental concepts in computer science and engineering. To improve the skills to work with abstract notions for solving computational problems. Teaching a particular programming language is not a primary objective; the language will serve as a medium for experimentation.

Textbooks:

- *Introduction to Computer Hardware and Systems: Lecture Notes*, by G. Üçoluk and S. Kalkan, 2024.
- *Introduction to Programming Concepts with Case Studies in Python*, by G. Üçoluk and S. Kalkan, Springer 2012.

Tentative Outline:

Week	Notes	Course Material	Lab Cov.
Week1 29.09		• Introduction [0.5 week] Course content, objectives, outline; Grading; Information about the homeworks, the labs, the exams; Newsgroup, Website • Computing and Computation [Tot.:2 weeks] What is computing/computation? Digital computation, analog computation and nature's computation: Pros and Cons;	No lab
Week2 06.10		• Computing and Computation [Tot.: 2 weeks] Digital computation; Basic digital computational elements: Switches, transistors, vacuum tubes, water stream taps; How to make basic gates; How to build bigger/complex circuits; Boolean Logic – Digital Circuit connection; Truth table; 1-bit addition, N-bit addition; Memory: Using capacitance	No lab
Week3 13.10		• Computing and Computation [Tot.: 2 weeks] Von Neumann architecture: The separation abstraction of Memory, CPU; Pros and cons; Conceptual separation of data & algorithm; Limits of the register size and the processor design on the types of the primitive data; Overcoming these limits	Department's Electronic Services, Newsgroups, Introduction to Linux

		Binary Representation of: [0.5 week] Integers: 2s and 1s complement; Floating points (IEEE 754 standard); Characters (ASCII Table); Strings	
Week4 20.10		- Von Neumann Architecture: Revisited: [0.5 week] Machine-level instructions; Fetch-Decode-Execute cycle and how it works; Different registers: MAR, MDR, IR, PC; The need for higher-level languages: assemblers and more - Other components of a computer: [0.5 week] BIOS, Boot device, MBR, OS; Booting up a computer; Interrupts: service interrupts and time interrupts. Their importance and usage; Virtual memory. Physical and logical addresses. Paging. DMA; Rotational Storage Devices.	Linux Commands
Week5 27.10	29 th is holiday	- The world of programming and the zoo of programming languages: [0.5 week] Compiled vs interpreted languages; Programming paradigms: Imperative, Functional, Object-oriented, Declarative-Logical, Parallel-Concurrent; How do we choose among the paradigms and the available languages; Current trend. 'Simple' data types [0.5 week] number: float, int; string; list: lists of numbers, strings and nested lists; variables and naming conventions; type function	Linux Commands, Vim
Week6 03.11		Introduction to operators [1 week] Operators on numbers: Addition, multiplication, division (integer and float); Operators on strings: Concatenation, repetition; Operators on lists: Length, access and membership operators, addition, deletion; BNF notation; Ordering; Explicit, implicit casting, Type conversion; Assignment, l-type and r-type expressions; Expression evaluation	Quiz
Week7 10.11		Conditionals and loops [1 week] Boolean values; Turing machine, Determinism, Discreteness and conditionals; if statements; while, for statements	Python introduction, Basic data types
Week8 17.11		Functions [Tot.: 2 weeks] system defined: type, length, print; using "import"; simple math functions; user defined: defining a function, value of functions, call by value and reference	Advanced data types (str, list, tuple)
Week9 24.11		Functions [Tot.: 2 weeks] recursion	Functions and conditionals
Week10 01.12		MIDTERM	Recursion
Week11 08.12		More on data types [Tot.: 3 weeks] stack, queue, priority queue, tree and others.	Iteration: for, while statements
Week12 15.12		More on data types [Tot.: 3 weeks] stack, queue, priority queue, tree and others.	Iteration and Recursion - Recap
Week13 22.12		More on data types [Tot.: 3 weeks] stack, queue, priority queue, tree and others.	Abstract Data Types: Stack, Queue and Tree
Week14 29.12	Jan 1 is holiday	Object oriented concepts Encapsulation, inheritance, polymorphism, etc. Examples with OOP.	More on trees: N-ary Trees

Grading:

Midterm	%22
Turing Machine Exam	%5
Lab Exams	%45
Participation	%3
Final	%25

- Most assignments will be programming assignments (some could be exercises to be written up).
- The laboratory schedule will be announced later.
- Starting with the Weeks 4-5 the laboratory sessions will go in parallel with the lectures. You will have a chance to practice concepts introduced in the lectures.
- Attending the lab sessions is mandatory. **Missing two lab sessions will result in a grade of NA for the course.**

Web:

The webpage of the course will contain various material regarding the course: <http://ceng.metu.edu.tr/ceng111>

ODTUclass:

All communication, announcements, assignment collection etc. will take place at <https://odtuclass.metu.edu.tr/>

You **should** check this page *every day*.

METU Code of Ethics and Core Values:

“The members of the METU community are reliable, responsible and honourable people who embrace only the success and recognition they deserve, and act with integrity in their use, evaluation and presentation of facts, data and documents.”

All students are expected to honour this code and the core values outlined at: <https://www.metu.edu.tr/code-ethics-core-values>